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978,638

PATENT SPECIFICATION

DRAWINGS ATTACHED

978,638

Date of Application and filing Complete Specification May 23, 1962.
No. 19899/62.
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COMPLETE SPECIFICATION

Collapsible Roof Structure for Motor Vehicles

I HERMANN FLEMMING, of German nationality, of Torwang, Uber Rosenheim/Obb., Germany, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to collapsible roof structures for motor vehicles.

Arrangements are known of collapsible roof structures for passenger motor vehicles, which are not made of folding material, but of rigid, articulately connected structural components. In these arrangements the rear wall portion is so articulated to the coachwork body, that it can be swung back into a position forward of the rear axle and the roof portion which is articulated by its rear edge at the top to this rearward structural portion, lies on the coachwork body and thereby simultaneously also covers the lowered rear wall portion.

These known arrangements of the collapsible roof structural portions in practice involve quite considerable disadvantages when using the vehicle, particularly in the case of vehicles with a small wheelbase, in which the distance between the rear axle and the upper edge of the windscreen is small.

The angle through which the rear wall portion has to swing to bring the roof into its lowered position, hereinafter referred to as the "swivelling angle", is then in fact so small that the horizontal movement of the articulated roof portion, occurring during the backward swivelling, is insufficient to take its front edge from the upper edge of the windscreen to a position sufficiently behind the front seat, so that when the structure is opened there is a dangerous interference with the driver, fixed in between the steering wheel and the lowered front edge of the roof. A sufficient increase in the roof edge horizontal movement by increasing the swivel lever arm would necessitate placing the rear wall portion articulation point in the coachwork body lower, which would mean that when being lowered the rear portion of the structure would collide with the wings or with the coachwork base, or the rear portion would have to be so much diminished as to effect the seating space when the structure is closed.

These disadvantages are avoided by the invention and additional advantages are obtained, particularly in connection with operation. According to the invention, the collapsible roof structure for passenger motor vehicles comprises a rigid roof shell arranged to be lowered into a position where the roof front edge is adjacent the rear edge of the front seat rest and is connected to the body by a single link in the form of a rigid rear wall portion articulated to the roof and to the body, the point of articulation between the roof and the wall portion lying in front of the point of articulation between the wall portion and the body when the structure is closed, and spring means provided to counteract the weight of the rear wall portion.

It is admittedly known in roofing and lowering arrangements to compensate or decrease the difficulty of operating due to the force of gravity, by using springs, for the purpose of facilitating operation. With known structural arrangements, when the structure is closed the pressure on the rear wall portion due to the weight of the roof and the centre of gravity of the rear portion of the structure lie behind the point of articulation of the rear wall portion and the coachwork, and therefore act against the movement of closure of the structure.

With a swivelling angle of more than 90°, on the other hand, the rear roof application pressure travels forwards across the coachwork articulation point and furthermore decreases the distance of the centre of gravity

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from the rear portion of the structure, thus reducing the operational force required, particularly at the end of the closure movement. If the destressed spring forces are given such dimensions that they substantially balance the forces of gravity in their maximum position, it is thus possible to arrange that the spring forces act in the end position of the structure in the "close" direction and not in the "open" direction. It is particularly to be noticed in this connection that by changing the position of the roof portion which is freely movable by hand, the distance of its centre of gravity from the coachwork articulation point and hence also the forces of gravity acting during opening and closing can be affected, that is to say by keeping the roof flat the spring forces can be kept large (during closure) and by keeping it steep they can be made smaller (during the opening).

According to the invention the following is also of importance:

As in known arrangements by increasing the swivelling angle the roof length simultaneously decreases. The result is not only formally an unfavourable solution but the reinforcing ribs both of the roof rear edge and also of the rear portion front edge lie directly over or in front of the driver's head, that is to say in a particularly dangerous position if bumps or accidents occur. In order to avoid this, according to the invention the roof portion is extended rearwards beyond the point of articulation of the roof and the structure rear portion, in such a way that the articulated connection between the roof portion and the rear wall portion lies at least from a quarter to a fifth of the length of the roof in front of the rear edge of the roof.

The rear wall portion is advantageously so constructed that it is open at the top and only consists of a rear wall and side portions, whose upper edges are tightly applied in a multidimensional line against the rearward roof portion. The rear wall portion is thus formed merely as an upwardly open shell. The above-mentioned reinforcing ribs at the line of contact between the roof and the rear wall portion are thus automatically removed with the rearwardly extended roof into a zone not endangering those seated inside. At the same time, thanks to this solution in accordance with the invention, the stability of the closed structure is considerably increased, as because of the considerably increased distance between the point of articution and the jointing line between the roof and the rear wall portion the elasticity of the jointing strip can no longer have a deleterious effect; by the roof front edge, the point of articulation and the roof rear edge laying on the rear portion, an extraordinarily rigid connection of these parts is obtained, while further the connection is not effected in a straight line but along a two or three-dimensional line.

According to a further feature of the invention the articulated connection between the roof portion and the rear wall portion is provided at the lowermost edge of the roof portion or of the roof frame.

Furthermore according to the invention the roof rear edge may have at least one roller, by which the lowering of the roof is considerably facilitated and which in particular in the case of an elastic construction can act as a shock absorber.

The solution in accordance with the invention thus avoids not only serious technical disadvantages in use such as were involved by hitherto known constructions, but unites furthermore several essential hitherto unknown advantages in use and construction.

A specific embodiment of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 shows a side view of the roof structure in the closed position;

Figure 2 shows a side view of the roof structure in the opened position, and

Figure 3 shows a side view of the roof structure in an intermediate condition.

The collapsible roof structure consists of the roof shell 1, whose front edge 2 is connected with the upper edge 3 of the windscreen and whose rear portion 4 is connected to the foremost point 7 of the rear wall portion 8 by articulation pivots 5, which lie above the roof shell or roof frame lower edge 6. The rear wall portion 8 is fixed at the bottom on the right and left hand by articulation points 9 in the coachwork body 15. In this connection the articulation pivot 5 lies in front of the articulation point 9, so that the line *b* forms with the rear upper edge of the coachwork body 15 an angle greater than 90°. The supplementary angle α shown in the drawing is thus smaller than 90°. The front edge 10 of the structure rear portion 8 forms simultaneously a guide element for the rear edge of the lateral door window 11. The rear edge 12 of the roof shell 1 extends rearwards considerably beyond the articulation pivot 5, i.e. at least frm a fifth to a quarter of the roof shell total length and thus covers the rear wall portion 8 at the top. The rear wall portion 8 does not have its own roof, but only consists simply of a rear wall 13 and side portions 14. If the rear wall portion is swivelled rearwards by more than 90° from the coachwork articulation points 9, until it takes up the position 8^1 and its front edge has swivelled into the position 10^1 in the coachwork body 15, the roof shell is applied on the body at 1^1 in such a manner that its front edge comes substantially against the front seat back rest 16 as shown at 2^1. As shown in Figure 3

when opening or closing the roof structure by varying the roof shell portion 1^{11} its centre of gravity S^{11} can be displaced considerably from the coachwork articulation point 9 and thereby the expenditure of force for swinging the rear wall portion 8^{11} up or down is reduced in each case. Springs may be arranged in any desired manner as at 17 to compensate for the weight G^{11} of the rear wall portion 8^{11}. This point of application of the weight is nearer to the articulation point 9 when the structure is closed than when the structure is being moved. The pressure P due to the weight of the roof acting at the articulation pivot 5 is exerted when the structure is closed, in the "close" direction.

The roof shell 1 may have one or more rollers 18, which project rearwardly beyond its rear edge 12 and are guided in folding back the roof shell on to the upper covering of the rear coachwork lower portion 15. These rollers 18 may be fitted with springs or be of elastic material in order to act as shock absorbers.

WHAT I CLAIM IS:—

1. A collapsible roof structure for motor vehicles comprising a rigid roof shell arranged to be lowered into a position where the roof front edge is adjacent the rear edge of the front seat rest and is connected to the body by a single link in the form of a rigid rear wall portion articulated to the roof and to the body, the point of articulation between the roof and the wall portion lying in front of the point of articulation between the wall portion and the body when the structure is closed, and spring means provided to counteract the weight of the rear wall portion.

2. A roof structure as claimed in claim 1, wherein the point of articulation between the roof shell and the rear wall portion is positioned at the lowermost edge of the roof shell.

3. A roof structure as claimed in claim 1 or claim 2, wherein the articulated connection between the roof shell and the rear wall portion lies at least $\frac{1}{4}$ to 1/5 of the roof length from the rear edge of the roof shell.

4. A roof structure as claimed in any of claims 1 to 3, wherein the rear wall portion consists of a rear wall and the side portions whose upper edges are tightly applied against the rearward portion of the roof shell.

5. A roof structure as claimed in any of claims 1 to 4, wherein the rear edge of the roof shell has at least one rearwardly projecting roller.

6. A collapsible roof structure for motor vehicles substantially as described herein with reference to the accompanying drawings.

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978638 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig.1

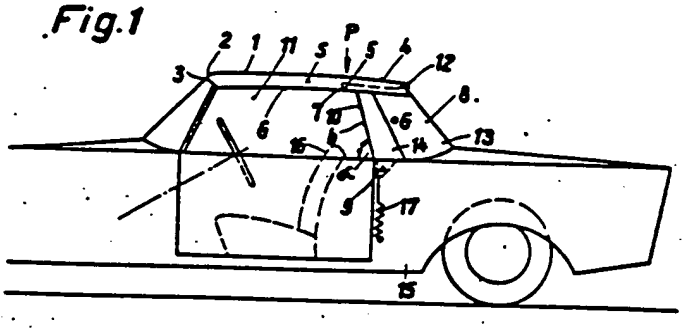

Fig.2

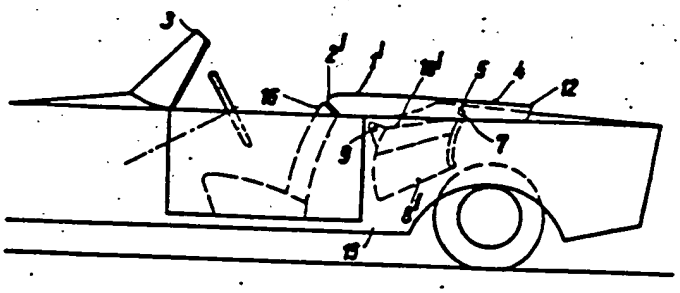

Fig.3